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Description	一般講演要旨

A Research on Green Strategy in Automotive Industry

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Abstract

A research question is the sustainable development in automobile industry. A green strategy is proposed to solve this problem. The main concept of Green Strategy—Green Design, Green Manufacturing, Green Marketing and Green Recovery are discussed. For application of Green Strategy, Green Value and Green Appraisal Model are proposed. Then I show the necessity of Green Strategy application for environmental protection and natural resource saving in automobile industry. Further, international competitive strategy will be needed to research.

Key words: Green Technology, Automobile Industry, Sustainable Business Strategy

Along with the economic development, the ecological system was severely damaged. For example, there are the environmental pollution hazardous to human health, traffic congestion, traffic accidental frequency, serious waste of resources, and energy depletion. All of the above have set new demand on the automobile development to the industry. People look forward the appearing of new car with energy-conserving and environment-protective functions. Therefore, the concept of green car is becoming important.

1. Concept of Green Car

Compared to orthodox car, the green car is not only using electricity or alternative fuel on an energy basis, but also is the green product that provides the least impact for ecological environment, the highest utilization rate of resources and the lowest energy consumption on the whole lifecycle. Green car integrates such new energy, new materials, application electronic, environmental and computer technologies, and reflects the environmental consciousness for impacts and changes of the automotive industry. It is the inevitable product from constant developing of automotive engineering.

Green car has the three characteristics.

- 1) Can be recovered to use. At the present time, the German government stipulates that automobile manufacturers must establish the waste automotive recycling center.
- 2) Improve the power source. Electric vehicle is the highlight of the green car development at present.
- 3) Reduce the environmental pollution. This is the most essential.

2. Development of Green Car

- 1) Classification of green car

Green car can fall into six categories by different fuel power. Traditional petroleum fuel, coal-oil fuel, hydrogen and gas fuel, storage battery fuel, solar fuel and biofuel. See the table to compare the advantages and

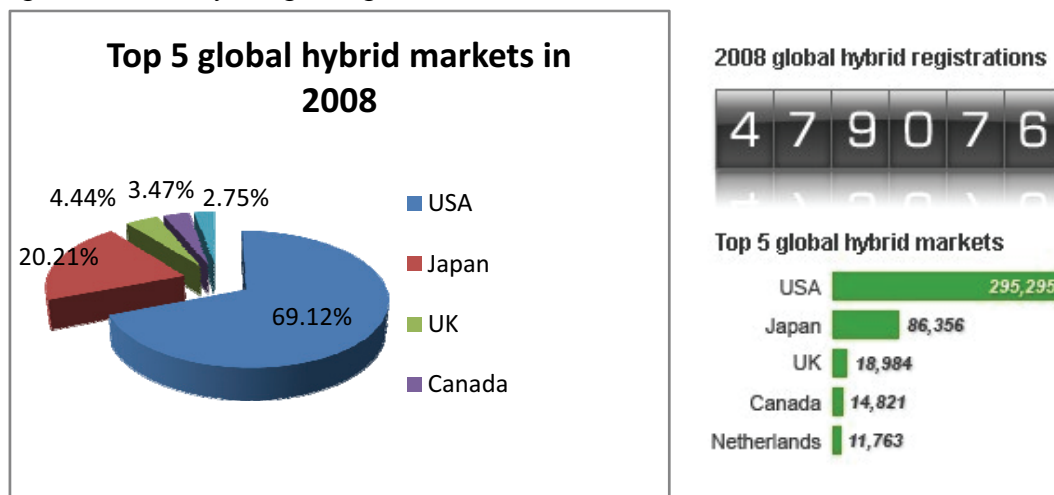
disadvantages of different fuel.

Table 2-1 Classification of green car

	Advantages	Disadvantages
Hybrid vehicle	<ol style="list-style-type: none"> 1. Compared with similar engines, reducing emissions. 2. Improved vehicle's fuel economy. 3. Through reduction in load of engine to reduce noise. 	<ol style="list-style-type: none"> 1. Price of the car is expensive 2. Power is not better than petrol 3. Have a little pollution
Hydrogen and gas fuel	<ol style="list-style-type: none"> 1. Exhaust emissions is water, don't produce any pollutants on driving. 2. Hydrogen is a renewable resource. 	<ol style="list-style-type: none"> 1. High cost of hydrogen fuel cells 2. Extraction of hydrogen needs through brine electrolysis or to use the natural gas, and to consume a lot of resources.
Storage battery fuel	<ol style="list-style-type: none"> 1. Technology is relatively simple, can charge on everywhere. 2. Zero draining, zero pollution, zero noise 	<ol style="list-style-type: none"> 1. Cost of battery is high. 2. Weight and volume of battery is great. 3. Charging speed is slow
Solar fuel	<ol style="list-style-type: none"> 1. can supply electric power on sunny place 2. no pollutant on driving 	<ol style="list-style-type: none"> 1. Need large Solar Panels. 2. Influenced most by weather. 3. Short of power

2) The situation of hybrid vehicle

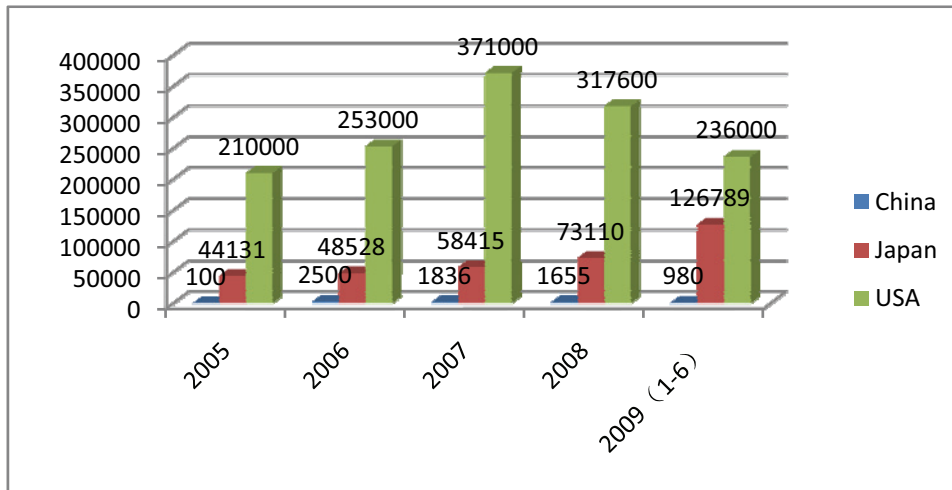
At present, hybrid vehicle is the mainstream in the market of green car. It has become one of the fastest developing and most widely being used green cars.



Graph 2-1

It has 479,076 hybrid vehicle of the world in 2008. The United States is the country with the biggest number of hybrid vehicle. Japan is the country with the highest production of hybrid vehicle.

Next chart is hybrid vehicle sales in China, Japan and USA from 2005 to 2009.



Graph 2-2

Dual-mode is the most advanced technology in hybrid vehicle. Only three companies have this technology in the world. They are BYD, Toyota and GM. Make comparisons among them.

Table 2-2 Comparison among three main companies

	China BYD dual-mode electric vehicle	Toyota dual-mode electric vehicle	GM dual-mode electric vehicle
Name	BYD F3DM	Plug-In Prius	Chevrolet Volt
Time To Market	2008.12	2010~	2010~
Battery Type	iron battery	lithium battery	lithium battery
Battery Manufacturers	BYD	Panasonic	LG Chemical
On Pure Electric	100km	30km	64km
Charge Time	9h	7h	6h
100km/L	4L	3.6L	2.35L
Price	2.10MJYN	4.59MJYN	3.90MJYN

We can see from this diagram, BYD is more economical and practical, Toyota and GM are more luxury and high-grade.

Core technology of hybrid vehicle is battery. BYD F3dm is used iron battery. Plug-In Prius and Volt use lithium battery. Next we compare between BYD iron battery and lithium battery.

Table 2-2 Comparison between two main batteries

	BYD iron battery	Lithium battery
Voltage	3.3V	3.6V
Capacity	1000kwh	1200kwh
Weight	30kg	26kg
Cycles	2000 times	1000times
Cost	0.57MJYN	1.00MJYN
Safety	safe	Have risk
Charge time	9h	7h
Environmental protection	pollution-free	Recovery of lithium to consider

We can see from above data, both of them are nearly the same in many properties. But BYD iron battery is cheaper, safer and more durable than lithium battery. While lithium battery has been used widely at present.

3. Implementation of Green Strategy of Automotive Industry

This article divides the green strategy into four parts: green design, green production, green marketing, and green recovery.

1) Green Design

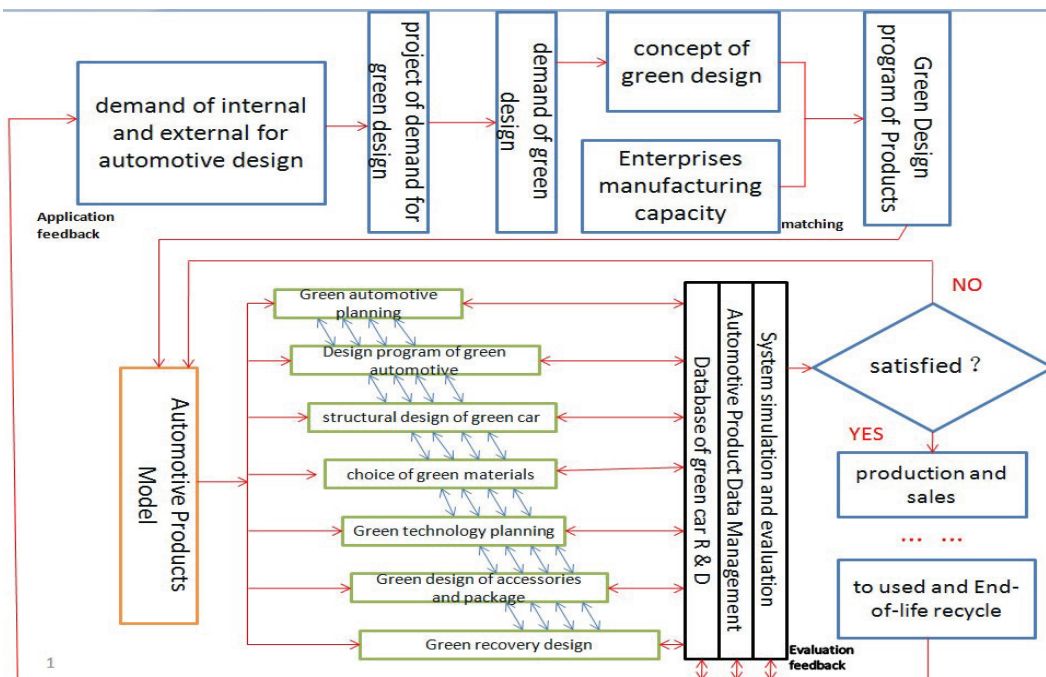
In order to fundamentally prevent pollution, and conserve resources, starting point depends on your design. During the design phase will be put the environmental factors and pollution preventive measures into product design. It means “Strive to make products the smallest impact on the environment”. In terms of industrial design, the core of green design is 3R: Reduce, Recycle and Reuse.

There are three methods of R&D of green design.

- (1) Life Cycle Design. The core is a process which includes production, using, scraping, recycling and regeneration.
- (2) Innovative Design. According to the customer demand to develop the new car is different from improving existing product.
- (3) Concurrent Engineering Design. The main concern is type of organization of integration and concurrency. The core is through team work to complete the design task.

This article based on these three methods proposes the synthetic method of green design.

Use a graph showing as follows.



Graph 3-1 Green strategy

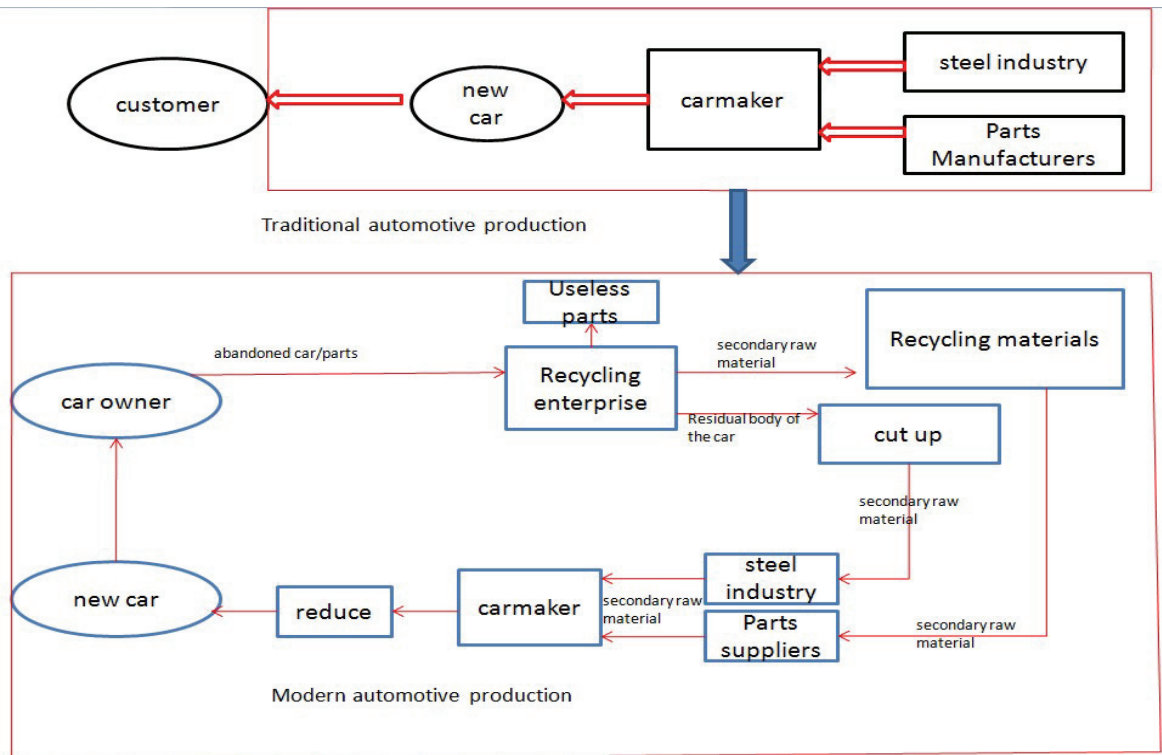
Automobile manufacturing enterprises form a set of design requirements by collecting internal and external demand information through the green automotive design engineering. According to these requirements, the design department can largely determine the design concept. At the same time, investigate the production capacity of enterprises. On the basis of products model of the car, Design department can make product planning. After the

assessment, if satisfactory, go ahead to produce, or if not back to redefine the model.

2) Green Production

Changes in the traditional automotive production, just only in order to improve quality, lower costs, and shorten delivery time, but didn't consider environmental factors. Modern automobile production has changed from “linear” to “cyclical” model.

It embodied in Graph 3-2.

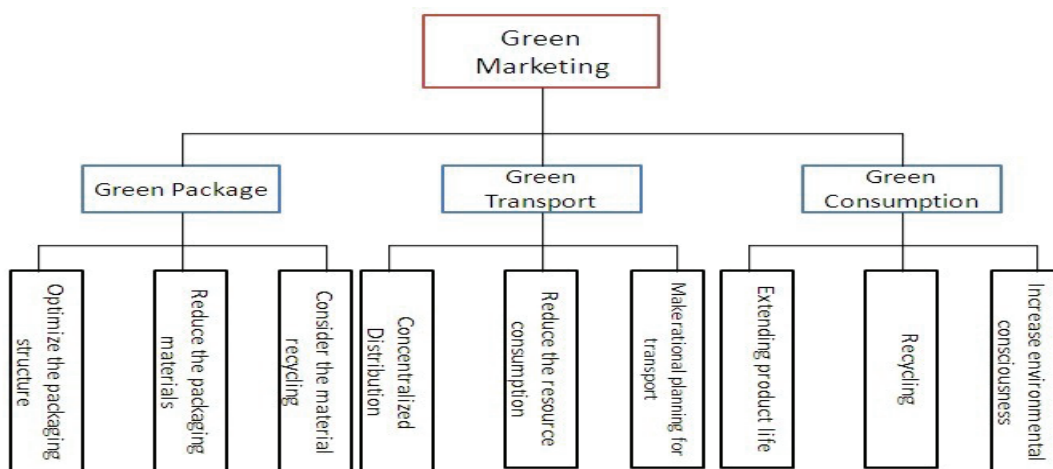


Graph 3-2 Shift of automobile production

3) Green Marketing

Green marketing mainly includes green package, green transport and green consumption.

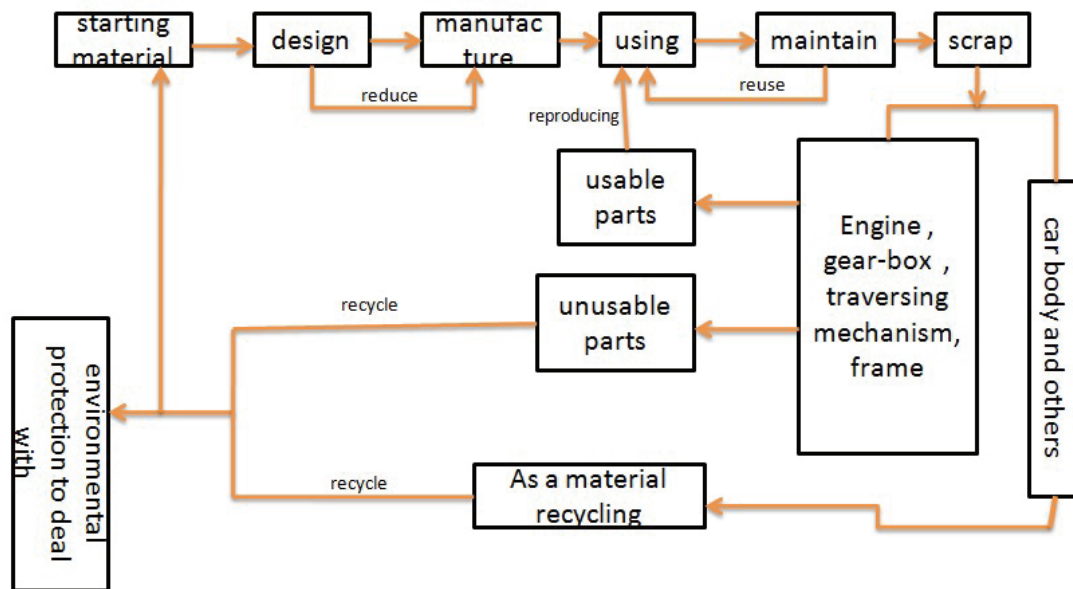
As shown in graph 3-3.



Graph 3-3 Green marketing

4) Green Recovery

The recovery of the products can be divided into three levels: production level, part level and material layer. As shown in Graph 3-4.



Graph 3-4 Green recovery

Improving the repeated utilization ratio, will reduce the loss, save resources, and thus purpose to achieve environmental protection.

4. Development Trend of Green Car in the Future

Development of Green Car is now only at a preliminary stage. Still need further research and development. Development trend of green car in the future will follow the stage of power frugal, pollution-free, safety and recycling.

China will be not only a big market but also a one of pioneering drive forces at advanced green technology at future vehicles development. Especially, such a radical change of power mechanism and its production system is a big chance for emerging companies like BYD rather than existing competitive company like Japanese or European car makers.

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